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FEDERAL - STATE - PRIVATE

SNOW SURVEY and WATER SUPPLY FORECASTS for ARIZONA

UNITED STATES DEPARTMENT of AGRICULTURE...SOIL CONSERVATION SERVICE,

SALT RIVER VALLEY WATER USERS ASSOCIATION

and

ARIZONA AGRICULTURAL EXPERIMENT STATION

Data included in this report were obtained by the agencies named above in cooperation with the Federal, State and private organizations listed on the last page of this report. FEB. 1, 1960

UNITED STATES DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE

TO RECIPIENTS OF COOPERATIVE SNOW SURVEY AND WATER SUPPLY FORECAST REPORTS:

The climate of the cultivated and populated areas of the West is characterized by relatively dry summer months. Such precipitation as occurs falls mostly in the winter and early spring months when it is of little immediate benefit to growing crops. Fortunately, most of this precipitation falls as mountain snow which stays on the ground for months, melting later to sustain streamflow during the period of greatest demand during late spring and summer. Thus, nature provides in mountain snow an imposing water storage facility.

The amount of water stored in mountain snow varies from place to place as well as from year to year and accordingly, so does the runoff of the streams. The best seasonal management of variable western water supplies results from fore-knowledge of the runoff.

A snow survey consists of a series of about ten samples taken with specially designed snow sampling equipment along a permanently marked line, about 1000 feet in length, called a snow course. The use of snow sampling equipment provides snow depth and water equivalent values for each sampling point. The average of these values is reported as the snow survey measurement for a snow course.

Snow surveys are made monthly or semi-monthly beginning in January or February and continue through the snow season until April, May or June. Currently more than 1400 western snow courses are measured each year. These measurements furnish the key data for water supply forecasts.

By relating snow survey measurements taken over a period of years to spring-summer runoff during the same period, relationships have been developed which make it possible to forecast seasonal runoff several months in advance of occurrence. In order to make a forecast, once a forecast relationship has been developed, the maximum snow water content at previously selected key slow courses is usually entered in the forecast relationship. More accurate forecasts are often obtained when other factors such as soil moisture, base flow and spring precipitation are considered and included in the forecast relationships.

Listed below are the Federal-State-Private Cooperative Snow Survey and Water Supply Forecast reports available for the West which contain detailed information on snow survey measurements, streamflow forecasts, reservoir storage, soil moisture and other guide data to water management and conservation decisions.

PUBLISHED BY SOIL CONSERVATION SERVICE

COOPERATING WITH RIVER BASINS UTAH STATE ENGINEER AND OTHER AGENCIES COLORADO AND STATE OF UTAH ____ MONTHLY (JAN.-MAY) ____ SALT LAKE CITY, UTAH ___ COLUMBIA AND STATES OF _____ MONTHLY (JAN.-MAY)____ BOISE, IDAHO_ 1DAHO AND ALASKA MONT. AGR. EXP. STATION UPPER MISSOURI AND STATE _____ MONTHLY (FEB.-MAY)___ _ OCT. 1, APR. 1. MAY 1 __ PORTLAND, OREGON __ WEST-WIDE __ STATES SALT R. VALLEY WATER SEMI - MONTHLY -___ PHOENIX AR ZONA -USERS ASSOCIATION (JAN. 15 - APR. 1) ARIZ. AGR. EXP. STATION COLORADO AND NEW MEXICO _____ MONTHLY (FEB.-MAY) ___ FORT COLLINS, COLORADO _ COLO STATE ENGINEER N. MEX. STATE ENGINEER - MONTHLY (FEB.-APR. ____ ENO. NEVALA ___ NEVALA DEPT. OF CONSERVATION AND NATURAL RESURCES -DIVISION OF WATER RESOURCES OREGON STATE ENGINEER _ MONTHLY (FEB.-MAY) ____ SPOKANE, WASHINGTON ___ WASH, STATE DEPT. OF _ WYOMING STATE ENGINEER __ MONTHLY (FEB. - UNE) __ CASPER, WYOMING ___ Copies of these various reports may be secured from. Head, Water Supply Forecasting Section 209 S. W. Fifth Ave., Portland 4, Oregon

PUBLISHED BY OTHER AGENCIES

MONTHLY (FEB. - JUNE) ___

CALIFORNIA _____ MONTHLY (FEB.-MAY) __

PRITISH COLUMBIA

COMPTROLLER, WATER RIGHTS BR., DEPT OF LANDS

AND FORESTS, PARLIAMENT BLDG., VICTORIA, B.C., CANADA
CALIFORNIA DEPT. OF WATER RESOURCES, SACRAMENTO.

for

ARIZONA

(Salt, Verde, Gila and Part of Lower Colorado River Basin)

Issued

February 2, 1960

Report Prepared

by

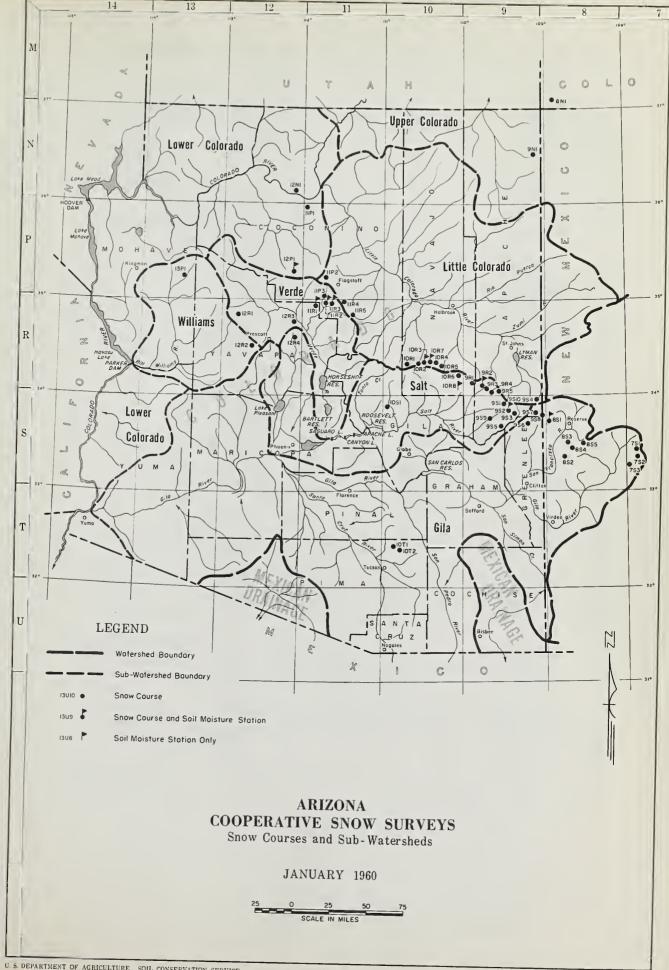
Richard W. Enz, Acting Snow Survey Supervisor Soil Conservation Service Post Office Box 929 Phoenix, Arizona

Issued by

Robert V. Boyle
State Conservationist
Soil Conservation Service

Victor I. Corbell President Salt River Valley Water Users' Ass'n.





INDEX to SNOW COURSES and SOIL MOISTURE STATIONS

NUMBER 36%	NAME	SEC	TWP	RGE ***	ELEVATION	RIVER BASIN
11P3	Antelope Park	29	19N	8E	7300	VerdeDiscontinued
9Sl	Baldy (p)	28	7N	27E	9125	Salt-Little Colorado
10T1	Bear Wallow	6	12 S	16E	8100	Gila
986	Beaver Head	13	ЦN	30E	8000	Salt-Frisco
983	Big Lake Knoll	2	5N	28E	8800	Salt-Frisco-Little Colorado
/-2		_				Discontinued
7S3	Black Canyon	8	13S	11***	6790	GilaDiscontinued
9S10-*	Black River Divide		6N	27E	9100	Salt-Little Colorado
12N1	Bright Angel	34	33N	3E	8400	Lower Colorado
12R1	Camp Wood	3	16N	6vI	5700	Williams-Verde
10R3-M	Canyon Creek	18	11N	15E	7500	Salt-Little ColoradoReplaced
10107-11	carry on the cen	10	T-11	1)11	1,000	by 10R7-M
						by Tolli-11
10R7-M	Canyon Creek #2	18	11N	15E	7500	Salt-Little Colorado
11R2-M	Casner Park	19	18N	8E	6930	Verde
12P1-M	Chalender	27	22N	3E	7100	Verde
10R8-*	Corduroy Creek	Ta+ 31,00	71N. Lone	3.110°08 W.	§ 6000	Salt
989	Corn Creek (p)	Tat. 330h	51N. Lone	g.109°45'W.	9 7730	Salt Not Read
/5/	doin dicek (p)	114.0°) 4.)-Ne HOHE	50107 47 110	3 1150	Dalu Not Head
8s3	Corner Mountain	7	10S	17W****	8850	Gila-Frisco Not Read
987	Coronado Trail	26	5N	30E	8000	Salt-Frisco
10R2	Elk	31	11N	14E	7600	Salt-Little ColoradoDiscontinued
10R6	Forest Dale	2	9N	21E	6430	Salt-Little Colorado
11P2	Fort Valley	22	22N	6E	7350	Verde-Little Colorado
	1010 (4110)			02	1000	70140 227020 00201440
9R5	Ft. Apache	18	7N	27E	9160	Salt-Little Colorado
8S1-M	Frisco Divide	31	6s	20W****	8000	Frisco-Gila
12R4	Gaddes Canyon	11	15N	2E	7600	Verde-Agua Fria
10R5	Gentry	36	11N	15E	7600	Salt
11P1	Grand Canyon	21	30N	4E	7500	Lower Colorado
	•		-			
11R5	Happy Jack	30	17N	9E	7630	Verde
10R4	Heber (p)	28	11N	1 5E	7600	Salt-Little Colorado
7S2	Inman	6	118	10W****	7800	Gila
12R2	Iron Springs	22	14N	3W	6200	Williams-Verde
982	Maverick Fork (p)	13	6N	27E	9050	Salt
9R4	McKay Peak	13	7N	24E	8250	Salt Not Read
9R2-M	McNary	14	8n	23E	7200	Salt-Little Colorado
9R1	Milk Ranch	28	8N	23E	7000	Salt
12R3	Mingus Mountain	3	15N	2E	7100	Verde-Agua Fria
882	Mogollon	3 2	115	19\\\\\\	7000	Frisco-Gila
11R4	Mormon Lake	13	18N	8E	7350	Verde-Little Colorado
11R3-M	Mormon Mountain	14	18N	8E	7500	Verde
11R1-M	Munds Park	7	18N	7E	6500	Verde
854	N-Bar Lake	16	108	17W****	8600	Gila Not Read
885	Negrito	6	10S	16W****	8200	Gila Not Read
	J					
9S4	Nutrioso	23	6N	30E	8500	Salt-Frisco-Little Colorado
985	Pacheta	At Town	of Maveri	ick, Ariz.	9 7800	Salt
9N1	Roof Butte	1 5	8и	6W+++++	8500	Little Colorado Not Read
10T2	Rose Canyon	15	12S	16E	7300	Gila
9 s 8	State Line	6	6s	21W****	8000	Gila-Frisco
					50 -7-	212
7Sl	Taylor Creek	20	108	10W****	7850	Gila
9R3	Trout Creek	5	7N	24E	6400	Salt Not Read
8NJ	Washington Pass			ng.108°50'W	9 8600	Little ColoradoNot Read
13P1	Willow Ranch	16	21N	11W	5000	Williams
10R1	Woods Canyon	15	11N	13E	7640	Salt-Little Colorado
1007	Monley Carola	2.2	637	11.0	6000	Discontinued
10S1	Workman Creek	33	6N	14E	6900	Salt

^{*} SOIL MOISTURE STATION ONLY

¥3+×¥ New Mexico Principal Meridian

**** NAVAJO BASE

 $[\]mbox{\ensuremath{\mbox{\#}\mbox{\#}}}$ Number indicates location of snow course within Coordinate rectangle, thus 9NI is Course #1 in coordinate rectangle 9N.

^{***} ALL IN GILA AND SALT RIVER BASE AND MERIDIAN EXCEPT WHERE OTHERWISE INDICATED.

 $^{{\}tt M}$ - Soil Moisture Station installed on or in vicinity of snow course.

G UNSURVEYED

⁽p) STORAGE GAGE INSTALLED ON OR IN VICINITY OF SNOW COURSE.

ARIZONA WATER SUPPLY OUTLOOK

February 1, 1960

- SNOW COVER: Although no additional storms have occurred since the January 15 report, the water content of the snow is still high. The snow pack on the Verde River drainage is 124% of average, while the snow cover on the Upper Gila Watershed is 210%. The snow courses on the Salt River drainage are 201% of average. Only Camp Wood reported no snow.
- STREAM FLOW AND WATER SUPPLY: The stream flow for the January through May period is forecasted to be 182% of average for the Salt and Verde Rivers, and 247% for the Upper Gila, if normal precipitation occurs during the remaining months. The Little Colorado River is predicted to flow 227% of average for the January through June forecast period.
- RESERVOIRED WATER: Heavy runoff has continued through January into the eight major reservoirs serving central Arizona. The total available storage is now 1,617,000 acre feet. This is 185% of average and 156% of last year's storage on February 1. Total storage is now 47% of usable reservoir capacity. Lake Pleasant and San Carlos Reservoirs are still far below capacity.
- SOIL MOISTURE: All soil moisture stations except one show the soil to be at field capacity to a four-foot depth. Additional precipitation should produce good runoff yields.



STREAM FLOW FORECASTS - FEBRUARY 1, 1960

The following summarized runoff forecasts are based principally on mountain snow cover and on the assumption that precipitation and temperature will be near average from the present time to the end of the forecast period. Appreciable deviations from normal of temperature and/or precipitation will correspondingly modify these forecasts.

	SEASONAL STREAM FLOW IN THOUSANDS OF ACRE FEET FORECAST PERIOD JANUARY - MAY INCLUSIVE							
SUB-WATERSHED, STREAM	Forecast Runoff	Percent 15-Year	Meas	1943-57				
and STATION	1960	Average	1959	1958	1957	Average		
Salt River at Intake	560.0	202	58.7	578.8	212.6	276.9		
Tonto River above Roosevelt	135.0	233	6.6	82.3	96.8	47.7		
Verde River above Horseshoe	250.0	130	73.8	309.4	266.3	192.4		
Gila River at Virden	125.0	256	16.3	155.3	22.3	48.8		
Frisco River at Clifton	110.0	243	14.6	195.9	20.6	45.3		
Little Colorado River above Lyman Dam*	15.0	227	2.1	22.7	1.6	6.6		

^{*}Forecast period for Little Colorado River above Lyman Dam is for January-June, inclusive.



STATUS OF ARIZONA RESERVOIR STORAGE - FEBRUARY 1, 1960

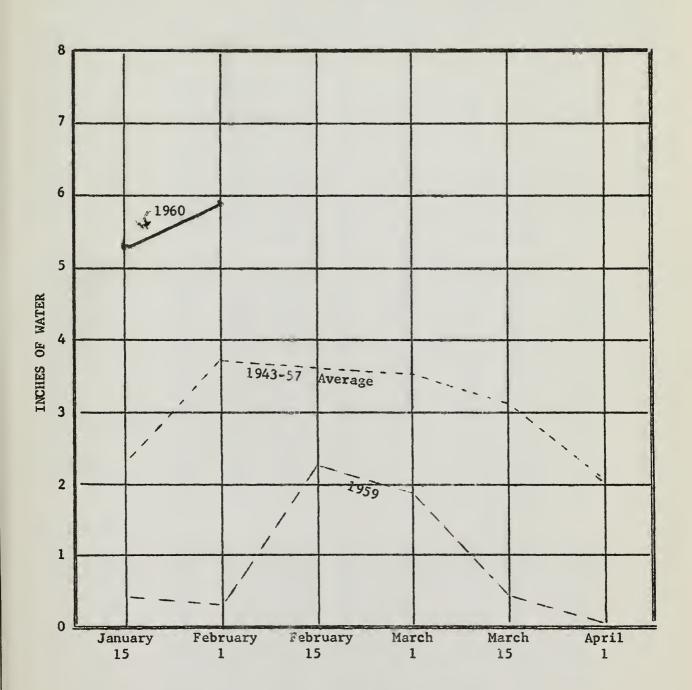
					1000 100	
SUB- WATERSHED and/or		USABLE CAPACITY 1000s	USABLE	STORAGE -	1000s ACR	E FEET 15-Year Average
STREAM	RESERVOIR	AC. FT.	1960	1959	1958	1943-57
		GILA I	RIVER SUB-WAT	ERSHED		
Agua Fria	Lake Pleasant	163.3	47.2	18.0	7.6	22.9
Gila	San Carlos	1,205.0	181.2	110.8	56.4	98.4
Verde	Bartlett	180.0	153.3	101.3	106.3	41.4
Verde	Horseshoe	143.0	104.5	7.0	1.8	12.7*
Salt	Roosevelt	1,381.6	767.5	440.2	44.4	442.3
Salt	Apache	245.1	239.8	238.2	207.0	194.1
Salt	Canyon	57. 9	57.1	54.4	54.4	33.4
Salt	Saguaro	69.8	66.6	65.9	56.0	28.7
		TOURN COL	00 4 00 0 7 1170 0	im managu	mp.	
		LOWER COL	ORADO RIVER S	UB-WATERSH	ED	
Colorado	Lake Havasu	619.4	539.1	547.7	519.5	592.7
Colorado	Lake Mohave	1,810.0	1,780.4	1,680.0	1,542.0	1,426.6*
Colorado	Lake Mead	27,207.0	19,283.0	22,515.0	20,013.0	17,488.0
Little Colorado	Lyman	30.6	10.3	18.3	8.0	5.9
Little Colorado	Show Low Lake	5.1	5.1	0.1	0.1	

^{*}Average is for less than 15 years of record in the 1943-57 period.

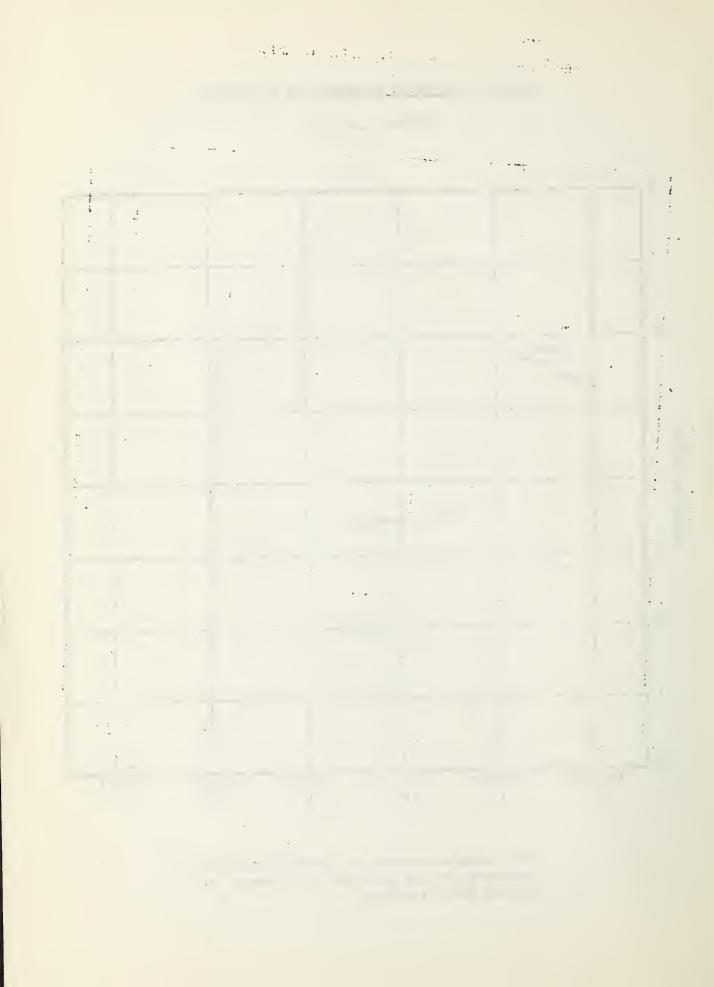


RELATIVE SNOW WATER ACCUMULATION IN ARIZONA

February 1, 1960



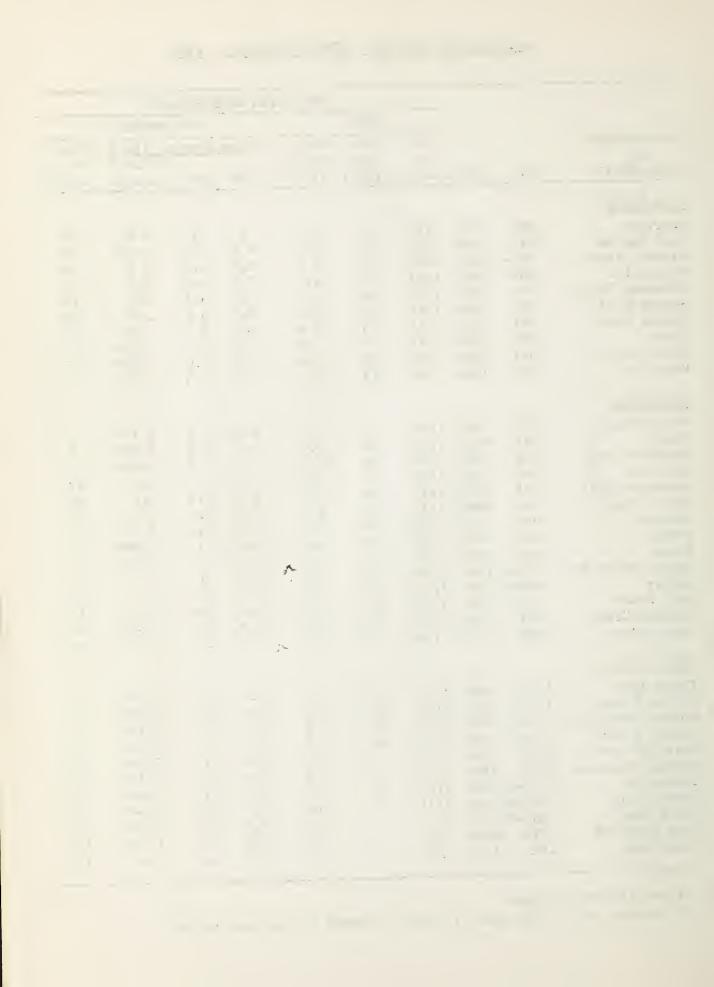
This graph represents the average snow water content on eleven selected snow courses on Arizona Sub-Watersheds.



			SNOW COVER MEASUREMENTS						
			1960			PAST RECORD			
SUB-WATERSHED			Date	Snow	Water	Water Content (In.)			Prior
and			of		Content			1943-57	Yrs. of
SNOW COURSE	No.	Elev.	Survey	(In.)	(In.)	1959	1958	Average	Record
GILA RIVER						6			
Nutrioso	004	9500	1/20	1 5	2 0	T	T	2.0	22
Bear Wallow	9 S4 10T1	8500 8100	1/29	15 32	3.8 10.7	0.0	0.3	3.0**	12
Frisco Divide	8S1-M		1/29	15	3.9	0.5	1.8	2.1	22
State Line	9S8	8000	1/29	21	5.4	0.0	1.6	2.5	22
Coronado Trail	9S7	8000	1/29	18	3.9	0.0	0.3	2.6	22
Beaver Head	9S6	8000	1/31	23	6.0	0.0	0.4	2.9	20
Taylor Creek	7 S1	7850	1/31	5	1.4	0.0	0.0	0.6	18
Inman	7S2	7800	1/31	7	1.9	0.0	0.0	0.5**	14
Rose Canyon	10T2	7300	1/29	20	6.0	0.0	0.0	1.6**	12
Mogollon	882	7000	1/30	12	3.1	0.0	0.0	0.7**	7
Mogorron	032	7000	1/30	12	2.1	0.0	0.0	0.7	•
SALT RIVER									
Ft. Apache*	9R5	9160	1/29	34	9.0	2.4	2.9	6.1**	7
Baldy*	981	9125	1/29	33	9.1	T	3.2	5.5**	9
Maverick Fork	9\$2	9050	1/29	36	10.9	0.0	4.4	6.4**	8
Nutrioso	984	8500	1/29	15	3.8	T	T	2.0	22
Coronado Trail	987	8000	1/29	18	3.9	0.0	0.3	2.6	22
Beaver Head	986	8000	1/31	23	6.0	0.0	0.4	2.9	20
Pacheta	985	7800	1/30	25	9.9	0.0	0.0	2.7**	10
Gentry	10R5	7600	1/30	20	6.8	0.0	T	3.0**	9
Heber	10R4	7600	1/30	19	6.4	0.0	T	3.2**	9
Canyon Creek #2	10R7-M	7500	1/30	21	6.7	0.0	T		2
McNary	9R2-M	7200	1/29	20	6.3	0.0	0.0	2.7	21
Milk Ranch	9R1	7000	1/29	13	4.3	0.0	0.0	2.0	19
Workman Creek	1051	6900	1/28	26	9.3	0.4	0.2	3.4**	8
Forest Dale	10R6	6430	1/29	9	2.6	0.0	0.1	1.5	20
VERDE RIVER									
Happy Jack	11R5	7630	1/31	18	4.7	0.0	0.0	3.0**	7
Gaddes Canyon	12R4	7600	1/29	24	7.4	0.6	0.3	3.4**	6
Mormon Mountain	11R3-M		1/31	20	6.8	0.0	T	5.1**	9
Mormon Lake*	11R4	7350	1/31	14	4.7	0.0	T	5.2**	12
Fort Valley*	11P2	7350	1/29	13	3.8	0.0	T	2.9**	13
Mingus Mountain	12R3	7100	1/29	7	2.5	0.0	0.0	1.7**	13
Chalender	12P1-M		1/29	15	3.7	0.0	T	3.4**	13
Casner Park	11R2-M		1/31	12	4.2	0.0	0.0	4.1**	9
Munds Park	11R1-M		1/31	8	2.6	0.0	0.0	2.6**	9
Iron Springs*	12R2	6200	1/28	8	2.5	0.0	T	1.7**	14
				0	0.0	0.0			14
Camp Wood	12R1	5700	1/31				0.0	1.5**	

^{*} On adjacent drainage.

^{**} Average is for less than 15 years of record in the base period.



ARIZONA SNOW SURVEYS - ABOUT FEBRUARY 1, 1960

			SNOW COVER MEASUREMENTS							
				1960			PAST RECORD			
SUB-WATERSHED and			Date of		Water Content			1943-57	Prior Yrs. of	
SNOW COURSE	No.	Elev.	Survey	(In.)	(In.)	1959	1958	Average	Record	
WILLIAMS RIVER										
Iron Springs	12R2	6200	1/28	8	2.5	0.0	T	1.7**	14	
Camp Wood*	12R1	5700	1/31	0	0.0	0.0	0.0	1.5**	14	
Willow Ranch	13P1	5000	1/26	7	0.7	0.0	0.0	1.0**	11	
LOWER COLORADO RI	VER									
Bright Angel	12N1	8400	No Surv	<i>i</i> ev			4.5	7.8**	11	
Grand Canyon	11P1	7500	1/31	12	3.5	T	0.7	2.6**	12	
Fort Valley	11P2	7350	1/29	13	3.8	0.0	T	2.9**	13	
Chalender*	12P1-M	7100	1/29	15	3.7	0.0	T	3.4**	13	
LITTLE COLORADO R	IVER									
Ft. Apache	9R5	9160	1/29	34	9.0	2.4	2.9	6.1**	7	
Baldy	981	9125	1/29	33	9.1	T	3.2	5.5**	9	
Nutrioso	984	8500	1/29	15	3.8	T	T	2.0	22	
Happy Jack*	11R5	7630	1/31	18	4.7	0.0	0.0	3.0**	7	
Gentry	10R5	7600	1/30	20	6.8	0.0	T	3.0**	9	
Heber	10R4	7600	1/30	19	6.4	0.0	T	3.2**	9	
Canyon Creek #2	10R7-M	7500	1/30	21	6.7	0.0	T		2	
Mormon Mountain	11R3-M	7500	1/31	20	6.8	0.0	T	5.1**	9	
Mormon Lake	11R4	7350	1/31	14	4.7	0.0	T	5.2**	12	
Fort Valley	11P2	7350	1/29	13	3.8	0.0	T	2.9**	13	
McNary	9R2-M		1/29	20	6.3	0.0	0.0	2.7	21	
Forest Dale	10R6	6430	1/29	9	2.6	0.0	0.1	1.5	20	

^{*}On adjacent drainage.

DELAYED REPORTS RECEIVED SINCE LAST BULLETIN - JANUARY 15, 1960

GILA & SALT RIVERS

Beaver Head 9S6 8000 1/16 33 6.4

^{**}Average is for less than 15 years of record in the base period.



LIST OF SNOW SURVEYORS

SNOW COURSE	SURVEYOR
Baldy	SCS and SRVWUA
Bear Wallow	Forest Service - W. D. Nelson
Beaver Head	N. A. Josh
Bright Angel	National Park Service
Camp Wood	Mrs. C. C. Merritt
Canyon Creek #2	SCS and SRVWUA
Casner Park	SCS and SRVWUA
Chalender	Forest Service - M. C. Oleson
Coronado Trail	Forest Service - Bill Brainard
Forest Dale	Fort Apache Reservation - Valverde & Endfield
Frisco Divide	Forest Service - Frank Carroll
Ft. Apache	SCS and SRVWUA
Fort Valley	Rocky Mt. Forest & Range Experiment Station
Gaddes Canyon	SCS - Wm. Gray
Gentry	SCS and SRVWUA
Grand Canyon	National Park Service - Vincent Hefti
Happy Jack	Julius Brantley
Heber	SCS and SRVWUA
Iman	C. H. McCauley
Iron Springs	Ernest Saxby
McNary	Fort Apache Reservation - Valverde & Endfield
Maverick Fork	SCS and SRVWUA
Milk Ranch	Fort Apache Reservation - Valverde & Endfield
Mingus Mountain	SCS - Wm. Gray
Mogollon	J. R. Wray
Mormon Lake	SCS and SRVWUA
Mormon Mountain	SCS and SRVWUA
Munds Park	SCS and SRVWUA
Nutrioso	Forest Service - Bill Brainard
Pacheta	Foch Phillips
Rose Canyon	Forest Service - W. D. Nelson
State Line	Forest Service - Frank Carroll
Taylor Creek	C. H. McCauley
Willow Ranch	Tiny Miller
Workman Creek	Rocky Mt. Forest & Range Experiment Station

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The Following Organizations Cooperate in the Arizona Snow Survey Work

FEDERAL

Department of Agriculture

Soil Conservation Service

Forest Service

Apache Forest

Coconino Forest

Coronado Forest

Gila Forest

Kaibab Forest

Prescott Forest

Rocky Mountain Forest and Range Experiment Station

Department of Commerce Weather Bureau

Arizona Section

Department of Interior

Bureau of Reclamation Region III

Geological Survey Arizona District

Bureau of Indian Affairs
Fort Apache Reservation

National Park Service
Grand Canyon National Park

Gila Water Commissioner Safford, Arizona

STATE

Arizona Agricultural Experiment Station

IRRIGATION PROJECTS

Salt River Valley Water Users' Association Phoenix, Arizona

San Carlos Irrigation and Drainage District Coolidge, Arizona

PRIVATE

Southwest Lumber Mills, Inc. McNary, Arizona

Other organizations and individuals furnish valuable information for the snow survey reports. Their cooperation is gratefully acknowledged.

OFFICIAL BUSINESS

TRST CLASS MAIL

Federal - State - Private
COOPERATIVE SNOW SURVEYS

Furnishes the basic data necessary for forecasting water supply for irrigation, domestic and municipal water supply, hydro-electric power generation, navigation, mining and industry

"The Conservation of Water begins with the Snow Survey"